Reduction of Azo Dyes by Flavin Reductase from Citrobacter Freundii A1

Abstract

Citrobacter freundii A1 isolated from a sewage treatment facility was demonstrated to be able to effectively decolorize azo dyes as pure and mixed culture. This study reports on the investigation on the enzymatic systems involved. An assay performed suggested the possible involvement of flavin reductase (Fre) as an azo reductase. A heterologouslyexpressed recombinant Fre from C. freundii A1 was used to investigate its involvement in the azo reduction process. Three model dyes were used, namely Acid Red 27 (AR27), Direct Blue 15 (DB15) and Reactive Black 5 (RB5). AR27 was found to be reduced the fastest by Fre, followed by RB5, and lastly DB15. Redox mediators nicotinamide adenine dinucleotide (NADH) and riboflavin enhance the reduction, suggesting the redox activity of the enzyme. The rate and extent of reduction of the model dyes correlate well with the reduction potentials (Ep). The data presented here strongly suggest that Fre is one of the enzymes responsible for azo reduction in C. freundii A1, acting via an oxidation-reduction reaction.